

exterior of the locking mechanism 310. The annular flange 420 defined by the pin rests at a proximal area above the at least one passageway 302 against a proximal end of the locking mechanism 310 when the pin 110 is fully received by the receiving port 312.

The method further includes sealing an outer surface 428 of the pin 110 against the side wall 315 defining a cavity 313 of the receiving port 312. The locking mechanism 310 may include the first and second seals 410, 510 protruding inwardly into the cavity 313 from the side wall 315 and is adapted to engage the outer surface 428 of the shaft 426. Air may be expelled from the side wall 315 via at least one release port 400 as the pin 110 is inserted into the cavity 313.

Accordingly, FIGS. 1-5 provide a number of components, schematics, and mechanisms for using vacuum tunnels within a pin 110 and locking mechanism 310 to create an elevated vacuum within a prosthetic device 100. In particular, embodiments of the present disclosure provide the ability to apply a vacuum force to the socket 108 only when a user has nearly completed donning the socket 108. Applying the vacuum force at this point may provide the benefit of not sucking a residual limb into the socket 108 in a way that can cause discomfort and/or injury. One will understand, however, that in light of the above disclosure it is apparent that implementations of the present disclosure exist that can apply a vacuum force through the pin 110 and locking mechanism 310 at any time—for example, before a user has inserted his or her residual limb into the socket 108.

Referring to FIGS. 6A-6C, another embodiment 600 includes a pin 610 defining a plurality of teeth 612 formed along an exterior surface thereof. The teeth 612 may be circumferentially formed about the pin 610 and may define a “rack” for engagement with teeth 622 of a pinion 620 supported by the locking mechanism 310. The pinion 620 is arranged to rotate as the pin 610 is inserted into the locking mechanism 310 through the cavity 313. The pinion 620 may be arranged so as to only rotate in a single direction when the pin 610 engages the pinion 620. The pinion 620 may be disengaged by suitable means from the pin 610 in order to permit withdrawal of the pin 610 from the locking mechanism 310. The remainder of the locking mechanism 310 may resemble the embodiment of FIGS. 1-5.

Turning to FIGS. 7A-7C, yet another embodiment 700 has a pin 710 defining a plurality of teeth 712 suitably angled to permit one-way engagement with teeth 722, 724 of a detent mechanism 720 biased into an middle portion 726 of the cavity 313. The detent 722, 724 may be formed unitarily and engaging the plurality of 712 from opposed directions, or the detent 722, 724 may be formed circumferentially. The detent mechanism 720 may be spring-loaded by a spring 728 so the detent 722, 724 is biased toward the pin 710 and the pin 710 is prevented from being withdrawn from the cavity 313. When desired, the detent mechanism 720 may be disengaged from the pin 710 by suitable means permitting removal of the detent 722, 724 from the pin 710 against the spring 728. The remainder of the locking mechanism 310 may resemble the embodiment of FIGS. 1-5.

The embodiments described may be used with a pressure regulator to insure the safety and comfort of the user, which may be achieved using mechanical and/or electronic methods known in the industry.

While the foregoing embodiments have been described and shown, alternatives and modifications of these embodiments, such as those suggested by others, may be made to fall within the scope of the disclosure. The principles described may be extended to other types of prosthetic or orthopedic devices.

The invention claimed is:

1. A pin lock for a prosthetic device in a vacuum assisted suspension system, comprising:

a pin defining a longitudinally elongate bore and at least one passageway extending obliquely relative to the bore and communicating therewith at a proximal end of the pin;

a locking mechanism having a receiving port arranged to receive the pin and a channel located at a distal end of the receiving port and adapted to communicate with the bore to exhaust air through the pin therefrom;

wherein the pin defines an annular flange protruding from a proximal area and a shaft extending distally from the annular flange, the bore being formed concentric with the shaft and the annular flange is entirely located above and proximally the at least one passageway.

2. The pin lock of claim 1 wherein the annular flange is arranged to rest against the locking mechanism when the shaft is fully received by the receiving port.

3. The pin lock of claim 1, wherein the receiving port defines a conical opening narrowing distally toward an elongate cavity adapted to closely receive shaft.

4. The pin lock of claim 1, wherein the receiving port defines a conical opening, the annular flange having an edge profile adapted to correspondingly mate with a surface of the receiving port defining the conical opening to seal thereagainst.

5. The pin lock of claim 1, wherein the receiving port defines an elongate cavity adapted to closely receive shaft, the locking mechanism including a first seal protruding inwardly into the cavity from a side wall defining the cavity and adapted to engage an outer surface of the shaft.

6. The pin lock of claim 5, further comprising a second seal protruding inwardly into the cavity from the side wall and adapted to engage the outer surface of the shaft, the second seal located proximally to the first seal and spaced a distance apart from the first seal.

7. The pin lock of claim 1, wherein the receiving port defines an elongate cavity arranged to receive the pin, the locking mechanism forming at least one release port located along the cavity and communicating to exterior of the locking mechanism to expel air therefrom.

8. The pin lock of claim 7, wherein the at least one release port extends generally perpendicularly to a longitudinal length of the cavity.

9. The pin lock of claim 7, wherein the receiving port defines an elongate cavity adapted to closely receive shaft, the locking mechanism including a first seal protruding inwardly into the cavity from a side wall defining the cavity and adapted to engage an outer surface of the shaft, the first seal located distally to the at least one release port.

10. The pin lock of claim 9, further comprising a second seal protruding inwardly into the cavity from the side wall and adapted to engage the outer surface of the shaft, the second seal located proximally to the first seal and spaced a distance apart from the first seal and at least one release port.

11. The pin lock of claim 1, wherein the at least one passageway generally extends perpendicularly to the bore.

12. The pin lock of claim 1, wherein the pin defines a shaft having a substantially smooth outer surface, and the bore is formed concentric with the shaft.

13. The pin lock of claim 1, wherein the pin defines an inset portion in which the at least one passageway is disposed and located below the annular flange.

14. The pin lock of claim 13, the inset portion provides a space between the pin and the receiving port when the pin is inserted into the receiving port.